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ENTOMOLOGY.—*A note on the occurrence of a pupal abnormality in the flour beetle Tribolium confusum Duval*.¹ THOMAS PARK, The Johns Hopkins University. (Communicated by RAYMOND PEARL.)

A rather curious pupal abnormality noted among stock cultures of the flour beetle *Tribolium confusum* seems worthy of brief mention. Two pupae were observed which obviously differed from the normal types in having their thorax and abdomen spirally rotated to the right with a corresponding distortion of the longitudinal axis. These relationships can be seen in Fig. 1 where photo-micrographs of normal and abnormal pupae in dorsal and ventral views are presented. In each illustration black lines have been ruled to correspond with the longitudinal axes. For the normal pupa a single, straight line accurately bisects the individual into right and left sides for head, thorax and abdominal regions. In the abnormal pupa it is necessary to draw four distinct lines to describe the axis from the dorsal view and three from the ventral view. Since nothing is known as to the larval history of these two individuals it is impossible to state if the abnormality was acquired early or late in metamorphosis. Likewise, it is impossible to conclude whether the abnormality is merely some developmental accident or whether a more fundamental basis is involved.

Interest was first attracted to these pupae since, in spite of their structure, they appeared very much alive and gave every indication of developing into imaginal forms. All young *Tribolium* pupae when lightly touched on the mid-ventral surface exhibit a marked flexing movement of the abdomen and it is frequently possible to distinguish between living and dead forms in this manner. This reflex was well developed for the two atypic pupae and suggested that, even though they possessed such an unusual external morphology, certain neuromuscular connections had been established at the time which permitted the described behavior to take place.

¹ Received September 17, 1936.

Of the two twisted pupae, one was a male and the other a female. The latter failed to emerge as an adult *Tribolium* while the former not only emerged but lived about nine weeks. This beetle showed few of the abnormalities characteristic of the pupa: the head and thorax were outwardly entirely normal and only the posterior part of the abdomen exhibited any deviation from type. This deviation con-

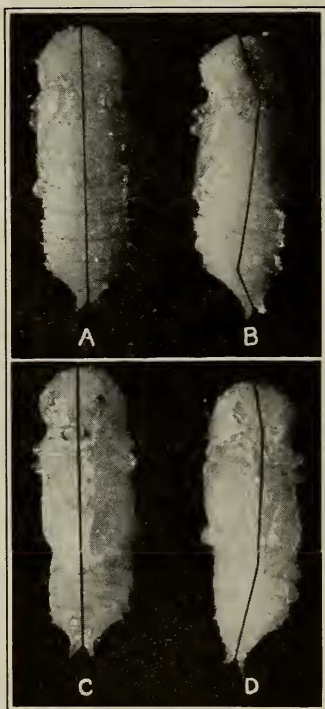


Fig. 1.—Photomicrographs of: A, Dorsal view of normal pupa; B, Dorsal view of abnormal pupa; C, Ventral view of normal pupa; D, Ventral view of abnormal pupa. (Enlarged about 10 times.)

sisted of a slight rightward turning of the terminal abdominal segments. The beetle, however, did not prove fertile for, although it was placed with several normal, virgin females, no viable eggs resulted. Whether this was due simply to the inability of the form to copulate, or, whether some more deeply seated mechanism was involved, cannot be said.

The principal purpose of this note is to place on record a new type of abnormality for *Tribolium*. The author is aware of three other such records. Two of these relate to metathetely or the appearance of wing rudiments in larvae of *Tribolium confusum*. The first report,

that of Chapman (1926), showed that larvae of the flour beetle occasionally develop wing pads when subjected to a "gas" sometimes produced by adult *Tribolium* when present in very dense and disturbed populations. The second report (Nagel, 1934) described the appearance of metathetelous, last instar larvae due to low temperature. The third record (Park) reports the occurrence of a Mendelian recessive gene which causes certain central facets in the eyes of *Tribolium castaneum* Herbst to lack pigment.

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